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ON
THE MEANS
OF
SUPPLYING MILK FOR THE POOR.

BY
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COMMUNICATED TO THE BOARD OF AGRICULTURE.

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SUPPLYING MILK FOR THE POOR.

MY LORD,

THE increased spirit with which agricultural pursuits have been carried on for some years past, in every part of the United Empire, may in no small degree be attributed to the zeal and attention of your Honourable Board.

The encouragement it has held out, has proved a powerful inducement for undertaking different experiments; and by the communication of their results to the public, much useful knowledge has been diffused.

Confiding in your experienced indulgence, and stimulated by the premium offered for the management of winter dairies and supply of milk for the poor, I beg leave to submit, with great diffidence, the result of what I have done in the last two years, towards accomplishing those objects.

The vicinity of a large and populous town had previously afforded me an opportunity of being acquainted with the great scarcity of milk, and consequent sufferings of the poor, especially where there are young families, from the impossibility of obtaining, for the greatest part of the year, a supply at any price.

My attention had long been called to the subject, and the accidental perusal of a tract* intended to show the number of lives lost to the community for want of this salubrious aliment for young children, determined me on making the experiment of furnishing a plentiful supply of new milk during winter.

I am fully aware that, to enable the public to reap any extensive advantage, I must be able to demonstrate that a fair and adequate profit is to be made; with this view my first enquiries were directed to ascertain the most usual modes of feeding dairy cows during the winter months, in the neighbourhood of large and populous towns, as also the expence attending it.

I found, wherever any quantity of milk was supplied, that the principal dependence was upon grains got from breweries or distilleries; and that it was not to be obtained in any profitable quantity without them.

* By Samuel Ferns, M.D.

The daily expense of the feed of a milch-cow near London, is estimated during the winter months at two shillings per day. The usual allowance as under :

	£.	s.	d.
One and a half bushel of grains - - -	0	0	9
Two bushels of turnips, at 5 <i>d.</i> per bushel -	0	0	10
Twelve pounds of hay - - -	0	0	5
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	0	2	0

Where hay alone was given, or in chief part, I was not so fortunate as to be able to find a single instance, in which any steps had been taken to ascertain the quantity of hay consumed in the feeding one, or any number of cows ; or the supposed expense attending it. The answer my enquiries received, in one of the first dairy districts near to London, where hay only is used, was, " That they gave just as much hay as the cows would eat." From the few trials I have made with the long-horned cattle, I am inclined to believe a milch-cow would consume in the twenty-four hours, from two stone to two stone and a half of hay.

The objections against feeding with hay are, First, the expense, which is much too high in the situations where milk is most required, to enable the dairy-man to afford it, either in sufficient quantities, or at a price to benefit the poor. Secondly, there are, besides, few populous towns so circumstanced as to admit of a sufficient quantity of hay-ground being procured for the support of an extensive winter dairy ; but, Thirdly, supposing it could be had, the superior profits to be made by a summer dairy would decide in favour of applying it to that purpose.

Most farmers consider it as more profitable to make butter in winter, than to sell their milk. I strongly suspect their calculations on this subject are not very correctly made, as I shall endeavour to show.

Having no means of procuring grains, and the price of hay precluding the possibility of employing it in feeding milch-cows with any prospect of advantage, I was driven to the necessity of adopting some other method.

On the first proposition for substituting green-food for the support of my dairy in winter, I was discouraged by a very prevalent opinion, that they could not be kept in condition, or health, on this food alone. I should most probably have declined the attempt, had I not witnessed the complete success of other experiments as much at variance with received opinions and common practice.

Having matured my plan, I determined to appropriate twenty-two acres of land, within less than a mile of a town containing eight thousand inhabitants, to its supply with milk, and the support of my other stock, during the winter months. I was in a great measure ignorant of the quantity of green-food that would be required for each head of cattle.

The ground was cropped with four acres of cow cabbages; six acres of common red turnip; two acres of Swedish turnip; one of kohlrabi; and nine acres of cole-seed. The milch-cows were turned out in good weather into a dry sheltered pasture of sixteen acres, which had been so hard stunted, as to afford them little or no food, but had the advantage of plenty of good water.

In the beginning of April, 1804, the cabbages were transplanted; by this early planting they have always succeeded better than those of my neighbours, which were later. The turnips were sown by the drill, in stitches at three feet distance, and the utmost attention paid to the cleaning of the whole, not only for their benefit, but for that of the succeeding crops. The turnips proved a failing crop in many parts, the other crops very good.

The stock of cattle fed in sheds consisted of thirty-three: twenty-two milch-cows, eight of them had been spring calvers, the remainder heifers. I notice this circumstance, to account for the apparent smallness of the quantity of milk afforded.

I was so circumstanced as to be necessitated to dispose of the greatest part of my stock before my winter crop was exhausted; having no preparation to continue feeding them in the house during summer, nor any distant pastures of less value than the lands I occupied near to the town, to continue them for another season. Much of the success of the experiment depended upon the condition the stock should be in, to enable me to dispose of them early, and with little loss. I had eight three-years old heifers, intended to be kept for stock; a bull and four cows for fattening; and besides these, I wintered thirty-five head of Highland heifers, and sixty-five sheep.

In dry and moderate weather, the milch-cows remained out from ten o'clock till towards evening. From their being kept in open sheds they were less sensibly affected by the cold. A greater degree of warmth is supposed to be favourable to their milking; but I do not believe, so kept, they would have been in equal thriving and healthy condition.

I found it advisable to make use of the cabbages first; they required much labour

and unremitting attention to be freed from decayed leaves; and after frost, the difficulty is still greater. It is however indispensably necessary to prevent the milk from being tainted.

The cabbages planted were the drum-head cabbage. I wish an equally weighty and more hardy kind could be obtained, that would stand the winter better, as the cost of cleaning and stripping the decayed leaves, tends greatly to reduce their value.

The common turnip followed; next the Swedish and kohlrabi; and last the cole-seed. This latter article of food I found to be most productive of milk, and it has the further advantage of standing till the end of May, by which time lucerne is fit to be cut.

I made a further experiment in feeding milch-cows, by giving oil-cake; this novelty encountered still greater prejudice. On trial it soon appeared that the milk was considerably richer, its flavour not affected, and the quantity much increased.

To this I attribute the uncommon condition of the whole stock so fed. The certificates, which accompany this, will be fully satisfactory upon that point.

My dairy commenced the 1st of October 1804, and continued constantly supplying the town till the 18th of May 1805. As a part of the heifers were not purchased till late in October, and not all in milk till the middle of November, I have extended the period thirty days above the two hundred, to complete the period for the whole stock upon which the calculation of food is founded, which will exceed, some little, the 200 days.

The time of milking in the morning was between six and seven; immediately afterwards a feed of cabbages was given, so long as they lasted. At ten o'clock, previous to turning out, two pounds of oil-cake each. In favourable days they had turnips in the pasture with the tops and tails cut off; on returning to the sheds they were served with cabbages; between that time and four they were milked: this was followed by a second allowance of two pounds of oil cake each; afterwards a third feed of cabbages; and at six o'clock a foddering of straw from six to eight pounds.

The labour of cutting off the tops and tails of the turnips was amply compensated for, by the advantage of feeding the wintering Highland cattle with them in preference to straw.

The expense of green food does not stand the farmer in one halfpenny per stone; the tops and tails must be considered of still less value: whilst straw cannot be

estimated under two-pence; notwithstanding the disparity of cost, there is still a greater difference in their nutrition. What I wintered as above, upon the refuse of green food, were in condition for killing two months earlier, and exceeded any of the same kind I ever had, both in weight of carcase and tallow, and brought from two to three pounds per head more than I had ever obtained before.

The plan I have followed in estimating the profits upon the experiment, is, in the first instance, to put a value upon the green crop, supposing it to be sold by the farmer to the milkman. I have afterwards united the two profits. I may be supposed to have over-rated the cost as well as the value of the green crops; this, however, is matter of opinion, and must depend in a great measure upon situation. The cost of cleaning drilled turnips much exceeds the broadcast, yet I have no doubt whatever, the weight will amply compensate for the expense; and, when the drill husbandry is properly attended to, will greatly exceed the general estimate of fifteen tons per acre. I shall endeavour to ascertain this fact against another year.

The apparent profit upon the milk, falls short of what I expected, and what I am confident it might and ought to have been, under proper management. It is sufficient, however, to encourage the hopes at first entertained of the practicability of the measure, and to determine me to proceed with the experiment.

With the experience I have gained, I have no doubt I shall exhibit a very different result of profits in the next year's trial.

Value of the green crop, upon a supposition of its being sold to the cow-keeper.

Twenty-two acres of green crop, at £10. per acre - - £.220 0 0

Estimate of expense attending the raising of each green crop, with cleaning, &c.

Four acres of cabbages, at £12. per acre	-	£.48	0	0
of Swedish turnips, at £5. per acre	-	10	0	0
Six of common red turnips, at £4. per acre	-	24	0	0
One of kohlrabi	-	5	0	0
Nine of cole seed, at £3. 10s. per acre	-	31	10	0
		<hr/>	118	10 0
Gain on the crops	-	<hr/>	£101	10 0

The improvements in the land and value of succeeding crops is supposed to be adequate to the rent and taxes.

Value of the land 40s. per acre.

Poor cess under 1s. 6d. in the pound.

Expense of feeding twenty-two milch-cows for 200 days ; each acre is supposed to produce 15 tons, or 2400 stones.

Allowing four stones of green food to each cow per day, for 200 days, would require seven acres.

	£.	s.	d.
Seven acres of green food, at £10. per acre	70	0	0
Four pounds of oil cake each, for 22 milch cows 200 days	69	8	0
Straw ditto, at 1d. per day ditto	18	6	8
Attendance, at 40s. per head	44	0	0
Interest on capital, valuing each beast at £13. £8.; expense of purchase 3s. £3. 6s.	11	6	0
Risk and loss by resale, after the rate of 30s. per head	33	0	0
By profit of milk	47	2	8
	<u>£.293</u>	<u>3</u>	<u>4</u>

Had the cows been tolerably well managed, the profits would have been double at least.

Money received for the produce of twenty-two milch-cows for 200 days.

	£.	s.	d.
By milk, butter, and calves, sold	224	0	0
Two calves reared with milk	20	0	0
Supplying five persons in farm-house, at one quart each per day	4	3	4
600 carts of manure, at 1s. 6d. per cart	45	0	0
	<u>£.293</u>	<u>3</u>	<u>4</u>

Oil-cake is too costly to be given with advantage, except to cows in full milk.

The eight spring calvers so fed, at a cost of £26. 13s. 4d. gave so trifling a quantity of milk, that three parts of this expense might have been saved, and made the profits above £60. Six calves were lost, which was a further deduction of £12.

It will appear obvious, from the sum charged for rearing two calves, that breeding cannot be attempted with a view to profit, where milk can be sold at 2d. per quart wine measure.

Expense of feeding stock upon fifteen acres of green food.

	£.	s.	d.
Estimated cost of 15 acres of green food, at £ 10. per acre	150	0	0
Eight three-years old heifers intended for breeding, fed with oil cake			
4 lb. per day each	26	13	4
Three cows fattening, 7 lb. ditto per day each	16	13	4
Carting turnips to the above, and wintering stock	28	15	6
Interest on value of the above estimated at 400, expense of purchasing			
included	12	11	0
Gain upon stock	86	16	10
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	£.321	10	0
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Manure, from feeding with oil-cake, is of double the value of common cow-dung.

Gain upon sale of the stock on 200 days feeding.

	£.	s.	d.
Three cows fed 200 days, cleared £ 13. each; cost of feeding £ 10.; profit £ 3.	39	0	0
Twenty wintering Highland heifers, cleared £3. 10s. each; cost of feeding £ 1. 10s.; profit £ 2.	70	0	0
Fifteen fat ditto killed in six months, cleared £ 4. each; cost of feeding £ 1. 10s.; profit £ 2. 10s.	60	0	0
Sixty sheep, cleared 10s. each; cost of feeding 6s.; profit 4s.	30	0	0
Eight three years old heifers, fed equal to milch-cows, supposed to make an advance of £10.; feeding £ 7.; profit £ 3.	80	0	0
One bull, feeding £ 10. supposed advance £ 5.	15	0	0
300 carts of manure, at 1s. 6d. per cart	22	10	0
Half an acre of Swedish turnips for horses	5	0	0
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	£.321	10	0
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The feeding stock, after the rate of the three years old heifers, can never answer at the common prices of cattle.

Expense of attendance on milch-cows and other stock for 200 days.

	£.	s.	d.
Dairy maid's wages - - - - -	5	0	0
Board wages - - - - -	9	0	0
One man and horse for sale of milk, and leading green food, at 4s. 6d per day - - - - -	45	0	0
One labourer, at 9s. per week - - - - -	13	10	0
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	£.72	10	0
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Cost of feeding milch-cows per day.

	s.	d.
4 stone of green food, at 1d. per stone - -	0	4
4 lb. of oil cake, at 1d. per lb. - -	0	4
8 lb. of straw - - - - -	0	1
	<hr/>	
	0	9
	<hr/>	

The feeding cattle had 7 lb. of oil-cake, which made the expense of these 1s. per day. The dairy maid's wages were wholly charged to the milk account, though by much the greater part of her time was employed in the farm-house. Some occasional assistance in milking was given, but by no means equal to what is overcharged to the dairy on her account.

Twenty pounds of butter were made per week, by which, I am very confident, I was a considerable loser. The skim milk was included in the butter account, and the quantity sold not ascertained. New milk was sold for 2d. per quart, wine measure; skim milk for 1d.

There were sold during the whole period 17,410 wine quarts; on an average 87 quarts per day. The demand was so great that the cart was met before it reached the town, and the whole disposed of, morning and evening, in little more than an hour.

The forward condition of my heifers made them sell early in the spring, and with less loss than I expected. I have estimated it at what I am told would be a fair average, one year with another. The price of cattle depends upon the season, and the quantity of fodder which remains on hand.

It was allowed by the dealers and others, there was no stock in the neighbourhood, however fed, that were in any thing like the condition of mine. To be able

fully to ascertain and establish this fact, is to remove a very weighty objection to the plan. Supposing the profit of the farmer and milkman united.

Gain upon 22 acres of green crop	-	-	-	£. 101	10	0
Ditto on milk £47. 2s. 8d.	Ditto on wintering stock	£86.	16s. 10d.	133	19	6
				<hr/>		
				£. 235		
				<hr/>		
				9		
				<hr/>		
				6		

Had the whole been well conducted, the profit should have been £300. out of which taxes, rent, &c. must be deducted.

Let us suppose thirty-three head of cattle to have been fed on hay, and that each consumed two stone per day; estimating the produce of an acre of hay at one hundred and sixty stone; at this rate it would have required eighty-two acres to have fed them for 200 days, admitting the after-grass to have been adequate to the support of thirty-five head of Highland heifers, and sixty sheep for the like space of time. If I am correct in this calculation, there will be found a clear gain to the public of sixty acres of land in the feeding of this trifling stock.

A moderate acre of green food, is supposed to produce 15 tons, or 2400 stone; but, with the drill husbandry, I conceive the weight will be considerably greater. After the rate of four stone per day, an acre would supply food for one beast for 600 days. At the rate of two stone of hay per day, it would require seven acres and a half, but say seven, allowing the half acre for the straw likewise given. We ought, in striking the balance in favour of green crops, to take into the account the impoverishment of the ground by hay, and the improvement by green crops. The drill husbandry, under judicious management, is the best mode of improvement, and might be alternately practised with green crops till the end of time.

I should suppose that green crops, upon a comparative scale of feeding with hay, may be stated as seven to one.

The expense attending the making and getting of hay is, in many parts of the kingdom, very great, and liable to much disappointment, both as to quantity and quality. There are many chances in favour of green crops, from being sown at different seasons, and, in case of failure, the being able to renew them.

The advantages of feeding with green crops, are the saving of rent, and the profits of a great stock upon a little ground. As some deduction from this may be stated, the additional buildings which would be required, but this would be trifling, and bear no proportion to the profits.

Potatoes and carrots, &c. will exceed seven times the comparative feeding of hay; and both these crops have the further advantage, they may be conveyed by water carriage from districts where rents are from 15s. to 20s. per acre, to where five or six pounds are paid, and labour proportionably high.

What encouragement does this hold out for the improvement of lands distant from populous towns, that have the advantages of water carriage!

Summer soiling, in comparison with grazing, will equal, if not exceed the proportion of seven to one, besides the almost incalculable advantage of preserving the manure.

I cannot omit stating the great profit of carrots. I have found, by the experience of the last two years, that where eight pounds of oat feeding was allowed to draft horses, four pounds might be taken away and supplied by an equal weight of carrots, and the health, spirit, and ability of the horses to do their work, perfectly as good as with the whole quantity of oats. With the drill husbandry and proper attention, very good crops of carrots may be obtained upon soils not generally supposed applicable to their growth. Under proper management an acre of carrots I conceive to be worth fifty pounds.

A saving of sixty acres of land in a farm of six hundred, in the feeding of cattle alone, opens a wide field for speculation. The retrenchment of a tenth, with a gain to the public of the means, if applied to the growth of corn, of supporting in bread one hundred and eighty persons, cannot fail of calling forth serious reflections, and challenging attention to the important advantages which might be drawn from the general adoption of this system.

However great and desirable the object of supplying milk to the poor, we lose sight of it in contemplating the prosperity and happiness that would result to all ranks of the community, from being enabled to produce sufficient grain of British growth, not only to feed our present population, but to supply the means of providing for a considerable addition to it.

Is it possible to contemplate the saving of sixty acres of land in feeding so small a stock, without being struck with the powerful resources which the public as well as individuals have in their power to draw from the adoption of such a plan upon an extensive scale?

May I hope, through your indulgence and permission, to be excused in offering

a few remarks upon the subject, which I trust will not be deemed irrelative, or wholly unconnected with that immediately before me.

Previous to entering into this discussion, I must beg to state, in addition to the saving made in feeding of cattle, there are annually forty acres or upwards of potatoes planted upon the same farm for feeding of horses, and given as a substitute for hay. An acre of potatoes produces upon an average fourteen hundred stone. Two stone of steamed potatoes, mixed with cut straw, are given daily to each horse: thus, an acre of potatoes produces food for one horse for seven hundred days. Computing one hundred and sixty stone of hay to an acre, and allowing only a stone and a half to be given per day, with a small abatement for waste, an acre would feed one horse for a hundred days; the scale of comparison therefore, in feeding, between potatoes and hay, will be as seven to one. Agreeably to this calculation, forty acres of potatoes are equal, in point of feeding horses, to two hundred and eighty of hay; and have the further advantage that, under proper management, the wheat after potatoes will not be inferior to a fallow.

By this system of tillage, in a farm of six hundred acres, a saving is made of three hundred and forty acres, above one half of the whole; which, supposing it were cropped with wheat, would supply bread for the consumption of above a thousand persons. There were likewise cultivated upon the same farm four acres of carrots, which, in feeding horses, equalled thirty acres of oats.

Besides the stimulus arising from individual emolument, which has hitherto been derived from this system, I have been strongly impelled to an extension of it, from the decided opinion I have long entertained, that nothing could contribute so essentially to the welfare and security of the empire, as being enabled to raise a sufficient quantity of grain for our support, and thereby to emancipate us from our dependance on foreign aid.

I lament, in common with many others, that the recent pressure so severely felt by the nation, did not lead to an immediate inclosure of all the wastes in the kingdom.

Independant, however, of eight millions of acres of wastes, which are supposed still to remain, and from which little profit is derived, I conceive it to be not only feasible but perfectly practicable, by a change of system, and adopting a plan of feeding horses and cattle in houses and sheds, both summer and winter) to make

such a saving of land as would accomplish this desirable object. Each acre so employed, as I have endeavoured to show, might be made to produce seven times the quantity of food raised from an acre of hay or pasture. The advantages derived from green crops, upon the present narrow scale, must be considerable: in what state would the agriculture of Norfolk and Suffolk be without them? Supposing the green crops in Great Britain to amount annually to a hundred and thirty or forty thousand acres, this would add a sixteenth part to the whole provision of the cattle and sheep.

Assuming the calculation to be sufficiently accurate for my purpose, which supposes England and Wales to contain about forty-eight millions of acres, and that twenty-one of these are under pasture for horses and cattle; I conceive a million and a half of acres might be taken from the lands in pasture, and brought under rotative crops, in aid of what is so applied at present.

I cannot entertain an apprehension, with the capital possessed by Great Britain, that any serious inconvenience could result to our general commerce, by the appropriation of such a sum as might be necessary to bring the lands so taken into cultivation; though I have heard such arguments gravely urged as an objection to a general inclosure. I should have no doubt of the means, and as little of the spirit of enterprise, provided it was clearly ascertained that the capital so employed would be equally profitable with other branches of commerce. To procure, in the first place, the additional number of hands that this extended cultivation would require, might be attended with some difficulty; but should the consequences of the encouragement given to agriculture prove a temporary check to our increasing manufactories, or even lessen the number of hands now so employed; so far, in my humble opinion, from its being injurious to the interests of the empire, I believe it would be found to promote them. I do, however, apprehend the hands necessary might be found without any interference with trade. Might not numbers of industrious hands be procured from the Highlands of Scotland, who, wanting employment, are obliged to emigrate to America? Numbers also might be drawn from Ireland, without any injury to its present state of agriculture and commerce. Should it cost the public half a million to settle the persons so collected in villages in different parts of the kingdom; could such a sum be better employed? the bounties of a few months would soon be swelled to a larger amount.

¶ The increased demand for labour, with the means of subsistence at a *reasonable* rate, would, in a very short period, produce an increase of population to answer all purposes.

The number of useful hands (by this means added to the population of the empire) would prove a powerful acquisition of strength. Can there be a more cogent argument in favour of growing the grain requisite for our own consumption? were all other considerations balanced; is not this one abundantly sufficient to decide upon the wisdom and policy of our attempting it? Under our present circumstances, one million of British subjects depend upon foreign countries for the means of their subsistence. In the course of time, when the north of Europe and America shall have made a further progress in manufactures, what is to become of that part of our population which is supported by them? If it be more advantageous to be a nation of manufacturers, than cultivators of ground, what country will continue to pursue agriculture for the benefit of another? If the example of Great Britain, in her predilection for manufactories in preference to agriculture, operates on other countries, the period is not distant when these supplies may be supposed to fail us. An alteration has been attempted in this system, and much appears to depend upon the firmness of parliament, whether it shall be persevered in, and encouragement be given for the growth of British grain; or whether popular clamorists shall prevail and defeat it, by acting upon the feelings of the moment; blind to every prudential consideration; regardless of future consequences; ignorant and insensible of our growing dependance on foreign countries for a very considerable portion of our daily bread.

The elucidation thrown upon this subject (by the discussions on the corn laws which took place in the last two sessions of parliament) must, or at least ought, to have demonstrated to every unprejudiced mind, the necessity of efficient means being taken to encourage the internal growth of grain. However unbounded our capital, can the country be esteemed really flourishing or secure, whilst it is not possessed of the means of feeding its inhabitants? The temporary loss of our superiority at sea, hostile influence, or a combination on the Continent, might effect by famine what their attempts by open war, I trust, can never accomplish. Is there wisdom or policy in suffering the empire to remain dependant on circumstances, distinct from its courage and love of liberty?

The wild and preposterous speculations broached a few years back, that it was

more for the interest of the nation to purchase than to grow grain, were well and ably refuted by a noble Lord (Lord Sheffield) at the time. Experience has since fully proved the folly and impolicy of the system founded on this theory. Much praise is due to all those who contributed to the establishment of that venerable code which, for the space of eighty years, proved such a source of wealth and internal comfort to the nation. The Minister (Mr. Pitt) had great merit in resisting the clamour raised against the alterations in the corn laws, in the last sessions of Parliament. It was most satisfactorily and clearly proved, that those alterations had no influence in raising the prices of grain. They might, and I believe did, encourage a more extended growth of corn; and, by so much as they increased the quantity, contributed to keep down the price, and diminish the effects of a failing crop. What reason can there be to doubt, that a recurrence to the same measures, would be productive of the same effects? During the seventeenth century, and at almost every period of our history (previous to the establishment of the system of bounties on exportation) the prices of wheat were subject to great variation, and the average extremely high. For forty years previous to 1700, the average price of wheat was £3. 0s. 11d. per quarter; prior to 1650, £6. 8s. 10d. From the period that the corn laws were finally settled in 1700 or 1706, the prices became steady. And for forty years prior to 1750 wheat was at £1. 16s. per quarter: in the next forty years to 1790 the average was £2. 9s. 5d.; and for the last ten years £3. 6s. exclusive of bounties.

In the course of the last forty years the balance between the agricultural and commercial systems has been destroyed. The latter now clearly preponderates, and its excess is likely to become ruinous. The increase of wealth operating upon a decreasing supply of corn has greatly tended to aid in raising the price of labour to the injury of agriculture. The reduction of the price of labour cannot be effected, without a general abatement of all the objects which have been affected by it. The only means to prevent the ruin of our agriculture is to advance the price of grain. The same causes have not yet operated in the North of Europe and America; and they are besides exempted from our heavy taxation, which exacts so much from each individual; and appears an almost invincible barrier to our receding. These combined causes enable the North of Europe and America to furnish grain cheaper than we can grow it extensively. There are indeed many millions of acres in Great Britain that would produce wheat, was the price sufficient; but on which

it will never be grown whilst foreign grain can be imported as heretofore. And I still doubt the average is taken too low to produce any considerable change.

The situation to which the country is reduced, demands efficient measures to be taken, to rescue it from the distressed state into which it has been thrown by the predominance of commerce over agriculture. Every step we advance the difficulty will be greater. Remedies are never pleasant: when necessary, however, they should be enforced.

Grain, the prime necessary of life, must be had; and, if it cannot be grown at the prices hitherto paid, it is sound policy to advance them to what will stimulate the production of a quantity equal to our wants.

To accomplish this object (should it even be the means of a diminution in our manufactures), the nation would be no loser by it. Our supplying foreign countries with manufactured articles depends upon a variety of circumstances. Our demand and consumption of grain is certain. One may cease, the other cannot be dispensed with but by a diminution of our population. Could a more serious misfortune befall the country than to be driven to such an alternative?

Allowing the prices of grain were such as to make it the interest of the farmer to grow corn extensively, in preference to grazing, or fully on a par with it; can it be doubted that we should shortly be enabled to raise a sufficiency for our consumption? The profits of tillage, once fully established, would speedily effect a total revolution in the existing system of agriculture. When no longer the interest of the farmer to make use of every possible means of expeditiously turning his lands into grass, expedients would be as assiduously devised for continuing the lands in a fit state for cropping. And I conceive this to be practicable, without injury to the land or reduction of crops; for which we have not only the example of China, but the partial practice of different places in this kingdom. There are lands in the neighbourhood of London which have been cropped with potatoes for forty years without interruption. The alternate culture of wheat and beans is practised in many districts without variation.

I would not be considered as an advocate for the advance of grain beyond what would afford the grower a full, fair, and adequate return for his capital and exertions: which I do contend has not been the case in the last ten years, with the exception of those of scarcity.

The necessity of measures to create an advance may appear an evil, when grain for the present might be had from foreign countries at a cheaper rate. But the miseries which must and would ultimately result from an increasing dependance on foreign nations, would infinitely outweigh any present advantage. And besides it admits of considerable doubt, (taking the average of a few years back), whether it would not have been cheaper both to the nation and individuals, had measures, like the present, been taken some years ago, to advance and encourage the growth of grain at home.

Years of failure of crops must, in the course of events, be expected; a demand for importation beyond the usual supply, has an immediate effect on the foreign markets, and subjects us to whatever demands speculators may think proper to exact. Considering the few hands in which the foreign trade is placed, the means of combination are not very difficult. Widely different is the case with our home supply; when there are half a million of manufacturers of grain, the public has little to fear from monopoly;—by which system are we likely to be most cheaply supplied?

The price paid in our markets for foreign grain was not the price it cost the consumers; a most material addition must be made for the bounty, which did not enter into the contemplation of many of them.

However much the late high prices of corn are to be lamented, it must be granted some good resulted from it, by producing an activity, and accelerating improvements in agriculture in every part of the empire; which, in the ordinary course of proceeding, would have required many years to have accomplished. It has also created a spirit of enterprise, which may be turned to good account, and, from what we have seen done, we may justly entertain the most sanguine expectations of the further improvements which may be still effected. Without profits would the manufacturer continue to prosecute trade? can, or ought, the farmer be expected to do it? The alarming disparity which has taken place in the course of the present reign, between the growth of grain and our consumption, is a subject worthy of our most serious consideration. They who are inclined to attribute it solely to our increased population, look, I conceive, but partially at the question. Was this the fundamental cause, its effects would have been of a slow and progressive nature. The population of Great Britain is supposed to have gained in the last century an addition of nearly three millions, which would give an increase

of thirty thousand annually. Whether this may, or may not, have been the proportion, or that the increase may have been more rapid at one period than another, I shall not contend; but I think it will be acceded to me, that the checks on population have been greater, since the year 1760, than they were for fifty years preceding it. That the improvements in agriculture in the last fifty years, are more than double what they were in the former. And in addition to this we must add the inclosures of nearly 900 wastes and common fields.

The consequences resulting from all these circumstances must be a prodigious increase of victual, tending to form a counterpoise to our increase of population in the present reign. Besides, up to 1761, we had a surplus of 925,119 quarters of wheat, which alone would have fed 925,000 persons. Five years after this period, in 1766, we had barely sufficient for our consumption; and from that period we have been obliged, with little exception, to make great annual importations. Such a change is too great and too sudden to be attributed to a progressive cause, or annual increase of population, but must, I conceive, be looked for from other causes. And I think we shall find a most important change taking place about this period in the habits and modes of living of a considerable number of the people, and producing an alteration in the system of agriculture. That other causes have also contributed, I have no doubt.

There are, unfortunately, no means of investigating, by positive proof, the alterations, which must have taken place in the system of agriculture. It would, in my humble opinion, be productive of essential benefit to the empire at large, should an accurate survey be taken of the whole kingdom, and a register kept in every parish, of the appropriation of each acre of ground. By thus ascertaining the various crops, and the quantity being known of each kind of grain, Government would be enabled to take timely steps to provide against deficiencies, and to enforce economy, which contributed largely in the late years of scarcity to the prevention of evils infinitely more grievous than those of price.

That a great and most material change in agriculture must have happened, I strongly suspect, within the last fifty years. The exportation in common years, up to 1761, was nearly equal to the growth of three hundred thousand acres. The largest year of importation since 1790 was adequate to the produce of nine hundred thousand acres, very little short of a third of the whole growth of the kingdom. Estimating ten millions of people in England and Wales, and our colonies, to be fed with

wheaten bread, one million supposed to subsist on barley and oats, and allowing a quarter for the support of each person; three millions three hundred thousand acres must be annually cropped to answer their consumption. Beyond this estimate must be added whatever is made use of in manufactures, which may extend to the produce of eighty or a hundred thousand acres. A twelfth part of this quantity is calculated to be deficient, and annually imported. In average years this would require the growth of near two hundred and eighty-five thousand acres.

It cannot be doubted, that the increased population of the country has had its share in creating the deficiency; but I consider the great and principal cause to arise from the increase of commerce, and the decrease of tillage. The wealth acquired by our various branches of manufactures has been the means of advancing wages, by which numbers of hands have been drawn from the country into towns. The consequence of which has been the entire change in their habits and modes of life; their former frugal manner of living is abandoned; they are no longer fed upon milk, cheese, and vegetables, with little or no animal food. *Less than two acres and a half* was then amply sufficient for the support of a labourer.

The whole body of manufacturers (as well as most of those employed in great towns), are since that period subsisted upon butcher's meat, with the constant use of malt liquor, and, I fear, the pernicious habit of using spirits is but too common amongst them. Five and a half acres of land will barely suffice to furnish them with the various articles of food and liquor. Supposing the number of manufacturers and others connected in trade to amount to three millions, to support them in the manner they now live, would require an increase of land, which would (according to their former mode of life) have supported an additional population of four millions. We must also add, as further causes of the deficiency, the great increase of our naval and military force; the waste of every article of prime necessity in the families of the opulent, multiplied, out of number, by our commerce. These combined causes have all contributed to increase the demand for animal food, and consequently to operate, with other causes, in lessening the growth of grain. The increase of butcher's meat in country markets within fifty years is prodigious. Meat, that was provided only at particular seasons, is now weekly, if not daily, offered for sale.

The following Averages, computed at the Distance of 9 Years each, shew the Number of Cattle and Sheep sold in Smithfield :

		Of Cattle.	Of Sheep.
From the year 1732 to 1740, per ann. the average was		83,906	564,650
1741 — 1749,	- -	74,194	559,892
1750 — 1758,	- -	75,331	623,091
1759 — 1767,	- -	83,432	615,328
1768 — 1776,	- -	89,362	627,805
1777 — 1785,	- -	99,285	687,588
1786 — 1794,	- -	108,075	707,456

We are not informed of the average of the last seven years, but understand it considerably exceeds that of any former period.

The following is a Comparison between the average Weight of Bullocks or Oxen, &c. 100 Years ago, and at the present Time :

		lbs.	lbs.
Oxen, 100 years ago, weighed	-	370	now 800
Calves,	- - - -	50	— 140
Sheep,	- - - -	28	— 80
Lambs,	- - - -	18	— 50

(Monthly Magazine, February, 1802, page 77.)

Smithfield market has (taking the increased weight of the carcasses into calculation), doubled the weight of flesh sold within fifty years. If such has been the increase in the capital, where luxury ever predominated, what must be the increased consumption of meat throughout the whole empire?

The alteration of the corn laws in 1773 operated still further to decrease the quantity of corn grown, by creating a competition of foreign grain in our markets; and that at a time when the profits upon grazing were already greater than on growing corn.

Every burden, (which the necessity of the state has imposed since that period,) has been a direct tax upon the plough, and consequently operated as a bounty on turning land from tillage to grazing. The increasing demand for workmen, for our

manufactories, has united with other causes to enhance the price of labour, and operated as a further check upon agriculture.

The great acquisition, and general diffusion, of wealth has been the cause of multiplying the number of pleasure horses. The very improvements in agriculture have made a large proportional number of horses necessary, which has been further increased by the obligation of performing a great deal of work by horses not only from the want of labourers in some districts, but also from the advance in the price of labour. The additional number of pleasure and agricultural horses has been the means of consuming the produce of a considerable portion of the best acres in the kingdom, and has had a powerful influence in diminishing the growth of bread corn.

I am confidently of opinion that a million and a half of acres might be spared from the pastures appropriated for the support of horses and cattle, and applied to the production of grain. In confirmation of this persuasion, I beg to state in the first place, what I conceive to be the quantity of land employed in the maintenance of the various descriptions of horses. By the returns to the tax office we are enabled to ascertain it with tolerable accuracy the number of horses in Great Britain.

The saving which might be made in feeding of cattle must rest upon conjecture, as we have no accurate criterion. The trials I have made justify the supposition of its admitting of very great retrenchment.

The number of horses that are entered and pay the duty amounts to 1,178,000, as appears from the returns of the tax office; and if we add those exempted as belonging to the army, &c. make allowance for the occasional evasion of the tax, we shall not much err in taking the total number at two hundred thousand: nine hundred thousand and upwards, of husbandry and draught horses are entered; and making the proper allowance for exemptions, and for such as may not have been returned, we may, I conceive, fairly estimate them at one million. — Suppose then

200,000 pleasure horses require	-	6 acres each, or	1,200,000
30,000 cavalry	-	5 acres	150,000
1,000,000 husbandry and draught horses	4 acres	-	4,000,000
200,000 colts, brood mares, &c.	-	3 acres	600,000
<hr/>			<hr/>
horses 1,430,000			5,950,000 acres.

Of the six millions of acres employed in feeding horses of various descriptions, suppose it to be divided between pasture and grain, allowing 4 millions for hay and grass, and 2 millions for oats, I do conceive, upon a moderate estimate, a twentieth part might be spared by feeding draught horses upon potatoes, carrots, and straw, instead of hay, and soiling them in summer, which would make a saving of three hundred thousand acres.

If it be correct that there are twenty-four millions of acres in pasture, deducting four millions supposed to be required for horses, there would remain twenty millions for the pasturage of cattle, &c. Does it admit of much doubt, that (by feeding milch cows, and fattening cattle with green food both summer and winter, in sheds) a saving of a sixteenth part, or one million two hundred thousand acres might be made? Granting me that one million and a half of acres might be taken from the ground hitherto appropriated to the pasturage of horses and cattle, we may naturally suppose them to be those nearest to towns, and of the best quality; most advantageously situated for manure, and consequently capable of producing above the average of estimated crops. But should I be thought too sanguine in my calculations, as to the quantity of ground that might be obtained,—still with a less proportion (from the nature of the soil and advantages of situation, from heavier crops and a more frequent rotation of wheat being taken) the object might be accomplished: supposing one-fourth to be under wheat annually it would supply all our present demands. By an appropriation of a fourth to green crops, a larger quantity of food would be produced than was supplied by the whole whilst under pasture; the remaining 750,000 acres could be left for other crops, and might be managed in such a manner as would prepare the quantity of land requisite for wheat. I might also with propriety state the prodigious saving which would be made by the general use of the drill. Upon the farm (to which I have so frequently referred) there are 100 acres sown with the drill, with a Winchester and a half to the acre, whilst the common practice of the district is three Winchesters. This makes a saving of 150 Winchesters, the cost of which would have been, at the time, £75.

The expense of the mode of tillage I have practised and recommended is undoubtedly great, and its answering must doubtless depend upon grain keeping up its price. If wheat falls much below 10s. *per* bushel, I should despair of the profits being such as would repay the farmer.

The average price of wheat for the last ten years I have stated to have been at £3. 6s. per quarter, exclusive of bounties; had this been the price in the first five years of that period, I verily believe it would have proved such an encouragement to the growth of grain as would have prevented the necessity of our prodigious importations, (and in great measure) saved the nation forty millions, paid for the purchase of foreign grain in that period, and seven millions of bounties to the exchequer.

Taking six years from 1793, the average will be £2. 17s. 6d. and excluding the years 1795 and 1796, which were both failing crops, the average of the four remaining years will be £2. 10s. 8d. an advance of only fourteen shillings and eight pence in a space of little less than a century. But permit me to ask, is there *any* advance? According to Sir George Shuckburgh Evelyn's Tables of the Depreciation of Money,—in 1589, one pound had as great power over the necessaries of life as £2. 9s. 8 $\frac{3}{4}$ d. had in 1800. If so, one pound sixteen shillings per quarter for wheat in 1700 would be equal in present money to £4. 8s. 8d. and this without estimating taxes, advance of labour, or other charges of cultivation.

What branch of commerce do we possess that is capable of producing a net gain of upwards of four millions and a half annually? Such, however, is the trade we appear to despise, notwithstanding a very considerable part of our national prosperity depends upon it.

I think little doubt can be entertained, by unprejudiced persons, of the advantage which must result from restoring a due balance between agriculture and commerce. That this can be effected without considerable difficulty I would by no means insinuate. We have the experience of the last-half century of the benefits that resulted from it; and this justifies the wish that the experiment should again be made. The continuance of our national greatness and our commercial prosperity appear absolutely to depend upon it.

I very much question the policy of importation bounties on corn, as a general principle, however necessary under particular circumstances: the policy and wisdom of exportation bounties are ascertained by the experience of eighty years, and appear amongst the many proofs of the wisdom and sagacity of the legislature of those times.

Could the nation be fully apprised of the danger of our situation, and our growing

dependence on foreign countries for bread, and reflect on the difficulties we have so recently experienced, as well as the enormous drain of wealth that we have sustained in consequence of it, they would cheerfully concur in the re-establishment of that system, which not only procured abundance to the kingdom, but enabled it to export grain to the amount of six hundred thousand pounds annually ; a sum little short of a million of our present money.

It is doubtless the interest of every member of the community to have grain cheap, and subject to as little fluctuation in price as possible. To have it of British growth appears the most rational way of accomplishing these desirable objects : but this cannot be looked for, or expected, unless the prices of grain be such as will enable it to be grown extensively, with a fair prospect of profit to the farmer.

The agricultural and commercial interests are so united that they must stand or fall together ; to restore and maintain an equal balance between them appears most conducive to our national prosperity.

As a matter of speculation, I should contend, that the landed interest had ultimately more to apprehend, from the high prices of grain, than the manufacturer ; and that any material fluctuation of price does more immediately affect its interest.

It must be allowed, that agricultural wages are regulated (in a great measure) by the price of the prime necessities of life : the late high prices of grain advanced wages forty per cent. In the years of plenty which have succeeded, it has been found impracticable to reduce them ; various other articles having also advanced, over which the fall of grain has no controul.

The labourer's scale of expence has kept pace with his wages, and he is as little able as ever to provide against any additional pressure ; so that should an advance take place in grain above the standard of common years (and his employer refuse a still further increase of wages), his family must have recourse to parochial relief, which ultimately brings a heavy burden upon the landholder.

Manufactural wages have always been much higher than agricultural, and depend in some degree upon the flourishing state of trade. If the demands slacken, the manufacturer gets his work done at a lower rate rather than the hands should be out of employ, or obliged to seek other situations. The mechanic (earning considerably more wages) can bear a moderate advance upon the prime necessities of life, either by the sacrifice of some superfluities, or by the extension of his hours of work.

Neither of these are in the power of the labourer ; he has no resources ; his confined means admit not of further retrenchment, nor is there any vacant time at his own disposal.

The manufacturer too has a free option whether or no he will continue his trade ; if he cannot do it to advantage, he may withdraw his capital, and leave his men to be supported by the landed interest, who are bound to share the last farthing with them : they are in the situation of the mariner, they cannot quit the vessel, but must abide its fate.

I trust that, by the prudential and wise measures which have been adopted, the interests of agriculture will be promoted, and those of the manufacturer secured upon a more solid basis, than they were whilst they were suffered to depend on circumstances over which the nation could exercise no controul.

I trust the ardent interest I feel on this subject, does not so far mislead my judgment, as to induce me to conceive that practicable, which in fact is only visionary. On the contrary, I flatter myself, that my ideas of the advantages that would result from an extended system of agriculture, and feeding of horses and cattle upon green food and other crops both summer and winter, in order to lessen the necessity of employing so large a portion of our most productive lands in pasture, will have the sanction of those whose coincidence of opinion will give weight to the plan I have adopted. Allowing it were to fall short of the whole advantage I conceive it capable of producing, it may, nevertheless, be attended with much general as well as partial benefit. At all events, I hope you will excuse my having occupied so much of your time, by entering thus largely into the subject.

January, 1806.—In the experiments of the former year I had many difficulties to combat ; great prejudice prevailed against the plan, and I was myself unacquainted with every thing relative to the dairy. By the pains and attention bestowed upon it, I trust I have gained such a knowledge of the subject, as to give the present trial a fairer prospect of success.

In the last year I was obliged to dispose of most of my heifers, having no preparation made to continue the keeping of them in summer, nor distant pastures where they might be grazed at a small expense, not exceeding forty or fifty shillings a head from May till October. There is a risk in heifers how they may milk, and they never give so much as after the second or third calf. Being now enabled

to keep such of the heifers as promise to milk well, a great risk is avoided, and the profits upon the same number of milch cows will be greatly increased without any additional expense. There is also a further advantage of having the stock more exactly in milk at the period required.

In all extensive corn farms there is not only a large quantity of chaff, but much refuse corn seldom used, except for poultry: these mixed and steamed make admirable feeding for cows, greatly promote their milking, and can scarcely be considered of other cost beyond the preparation. When I had no refuse corn, I made use of a small quantity of bran. I tried many experiments to dissolve oil cake by boiling, but I could not succeed. I am now about erecting a mill to grind it, in order to dissolve and mix it with the chaff. I have no doubt of being able by this means to make a great saving; I expect half what I now give will answer every purpose. The period fixed for the delivery of this report will prevent my being able to ascertain this, or to state the ultimate result of the produce of my green crop. Since the beginning of November I have received from ten to eleven guineas per week for milk, and expect it will continue to produce that, or more, for two months to come. Should the Board at any future period require further information, I shall be happy to afford it.

On the 1st of October I recommenced my dairy, the preparation for it, of green food, was as follows:

Eight acres of cabbages,
Ten acres of red turnips,
Two acres of Swedish,
One acre of kohlrabi,
Twelve of cole-seed.

The cabbages were delayed planting (from the extreme dryness of the season), till the beginning of May, which was a full month later than my usual time. They have proved the lightest crop I ever had, which confirms my predilection for early planting. They stood till the last week in January. The stripping them of decayed leaves requires a great deal of labour. The drum-head cabbage was what I planted; a hardier kind would answer better for standing the winter. I should be much inclined to try some of the Scotch coles, which, by proper care, might, I suppose, be increased to a large size, and would stand late. The turnips proved a very admirable crop. Agreeably to my former intention I made several trials to

ascertain the weight of an acre of drilled turnips: I weighed various plots of ten yards square, in different parts of the field, and found their several weights (differing very little) gave about 108 stone each, which is 32 tons and upwards per acre. There are many crops in the neighbourhood equally weighty, though none, perhaps, quite so clean. They succeeded wheat, and had about twenty carts per acre of ashes and street-rakings. They were sown in stitches, three feet asunder; the whole was worked from July till the end of September with the double mould-board plough and potatoe harrow, alternately taking the soil from the turnips and returning it to them. The stitches were besides twice hand-weeded and thinned. This mode of cultivation is attended with considerable expense, but I conceive it to be amply repaid both in the present and future crops.

Thirty-two tons per acre, at a farthing per stone, brings them to £5. 6s. 6d. The estimate of £10. an acre is moderate, as the turnips cost at that rate under a halfpenny per stone, which is but a fourth of the price of straw. The expence of pulling and carting is doubtless heavy; but, in strong lands, and where much wet falls, I conceive it impossible to attempt eating them off the ground with advantage: even where there is a pasture adjoining for the sheep to lie, the constant passing through the mire injures them so much as to prevent them fattening; at least I have found it so after many trials; but I speak of mountain sheep, having no experience of any other. The Swedish turnips were very good. The kohlrabi got to about five pounds each, the white were the largest, the purple the hardiest. Cattle and sheep are particularly fond of them; but I see no advantage they have over the Swedish, except that they may be got at in frost. The cole-seed was delayed sowing from the wet; and very cold weather succeeding prevented its making much progress. It may advance in spring, but to those who want it sooner it is a failing crop. My stock consists of 22 heifers, 8 cows, which were in milk during summer, and give but little milk in October, 4 spring calvers, 10 head of young cattle, and 3 bulls, and 4 fattening; total shedded 51: 50 Highland heifers and 150 sheep; part of the Highland heifers and sheep I have disposed of, which reduced my stock, at the commencement of the year, to 40 Highlanders and 120 sheep.

The cows were not in general milk till the beginning of November, when the milk obtained exceeded 50 gallons per day; 30 and upwards in a morning, and 20 in an evening. 160 Quarts of new milk and 40 of skimmed were sold to the

The plan of feeding was considerably varied from the former year. Immediately after morning's milking a stone of steamed chaff, which had been prepared the night before, and was now sufficiently cold, was given to each cow. After this followed three pounds of oil-cake. They were then turned out to water; on returning to their sheds they had green food. Previous to evening's milking a second feed of chaff, after it a further feed of green food, and at six o'clock a foddering of 6 or 8 pounds of straw.

Calculation of expense.—In estimating the cost of feeding, I shall take the whole
at 6*d.* per day:

Stone.	lb.		d.
2	0	Of green food	$0\frac{1}{2}$
2	0	Of chaff, &c.	2
0	3	Of oil-cake	3
0	8	Of straw	1
<hr/>			<hr/>
4	11	each.	$6\frac{1}{2}$
<hr/>			<hr/>

Cows which gave but little milk, and had no prospect of being improved:

3 Stone of green food	-	-	$d. \frac{3}{4}$
2 Stone of chaff	-	-	0 $\frac{3}{4}$
Straw 8 lb.	-	-	2
			1
			<hr/>
			3 $\frac{3}{4}$

As soon as I can accomplish bruising the oil-cake, I expect a pound and a half, or two pounds at most, will be amply sufficient, which will reduce the expense to five-pence per day. Upon an average I had, in milk, about 28 cows. They gave, (with the exception of those which had been in milk during summer) above eight quarts wine measure per day. The state of the atmosphere produced a very considerable alteration in their milking. I have known it vary two gallons a meal. I estimate the profit which might fairly be expected from each cow, as follows:

	£.	s.	d.		£.	s.	d.
220 Days, at 6d.	-	5	10	0	8 Quarts of milk for 220 days,		
Attendance	-	2	0	0	2d. per quart	-	14 13 4
Loss, risk, &c. &c.	-	3	0	0	33 Carts of manure	-	1 13 0
					Calf	-	2 0 0
	£.	10	10	0			18 6 4
					Cost	-	10 10 0
					Clear gain	£.	7 16 4

Supposing, instead of heifers, that the dairy was stocked with cows of the second and third calf, and the expence of keeping each estimated at sixpence, I think 10 wine quarts might reasonably be expected for 220 days, at the two meals.

	£.	s.	d.		£.	s.	d.
220 Days feeding	-	5	10	0	10 Quarts of milk for 220 days	17	12 0
Attendance	-	2	0	0	Manure	-	1 13 0
Risk and expence, say	-	4	0	0	Calf	-	2 0 0
	£.	11	10	0			21 5 0
					Expence	-	11 10 0
					Clear gain	£.	9 15 0

I think this profit will not be over-estimated, but may fairly be looked for. The quantity of straw consumed for fodder, &c. has so far exhausted my stock, as to oblige me to adopt expedients for bedding both cattle and horses. The substitute I have had recourse to is sea sand, which I can obtain within a mile. I use it so as to absorb all the urine, and expect it will be a very valuable manure for strong ground. I use a thin covering of straw over it for horses.

Expence of steaming chaff for a week, is as follows:

	s.	d.
A woman, who attends the fires and sells the milk, at 12d. per day, supposing		
her labour to be divided between the two	-	-
Half a hundred weight of coals per day, 3d.	-	-
	3	6
	1	9
	5	3

supplying Milk for the Poor.

	s.	d.	s ¹
100 Stone per day, 1d. per stone	8	4	
Expences	5	3	
Clear gain	3	1	

I have obtained an account of an experiment made last year by a very accurate friend of mine, of the feeding of four milch cows for 204 days, where hay in part was given :

	£.	s.	d.	
896 Stone of hay consumed by the four milch cows in 204 days, cost,				
at 6d. per stone	22	8	0	
10 Winchester bushels of ground oats, at 4s.	2	0	0	
64 Bushels of bran, at 13d.	3	6	8	
48 Stone of carrots, at 6d per stone	1	4	0	
Half an acre of cole-seed	2	10	0	
Attendance	8	0	0	
	39	8	8	
By milk, &c. sold	54	8	0	Profit by milch cows
Manure	5	0	0	
Four calves	8	0	0	Risk and depreciation in value, £3.
				per head
	£.67	8	0	
				Clear gain
				£.15 19 4

This gives a profit, within a fraction, of £4. each. Each cow appears to have given 8 quarts of milk per day, wine measure.

Cost of feeding, without attendance, is $9\frac{1}{4}d.$ per day.

The Quantity of Food given to each Beast, was:

	St.	lb.
Hay	1	6
Green food	2	0
Ground oats	0	4
	3	10

Experiments in making of Butter from the above Milch Cows:

	s.	d.
48 $\frac{1}{2}$ Quarts, wine measure, taken from the produce of the whole milk, yielded 3lb. 10z. of butter, which at 12d. per lb.	3	1
42 $\frac{1}{4}$ Quarts of blown milk, 1d. per quart	3	6 $\frac{1}{4}$
4 Quarts of butter milk, 1d. ditto	0	4
	<hr/>	
	6	11 $\frac{1}{4}$
48 $\frac{1}{2}$ New milk, 2d. per quart	8	2
	<hr/>	
Loss by butter, at 12d per lb.	1	2 $\frac{3}{4}$
	<hr/>	

By this experiment 16 quarts of milk were nearly required to a pound of butter. The Agricultural Report for Lancashire gives 18 quarts as the average quantity of milk for making a pound of butter from the hand churn, and 15 with the horse.

The following experiments were made under the immediate inspection of my bailiff, as I was doubtful of the accuracy of my own dairy, which stated a pound of butter to eight quarts of strippings: to reconcile so great a difference, the large proportion of heifer's milk, which is much richer than cows of the second or third calf, must be allowed as contributing something. The oil-cake, I have no doubt, is the principal cause of the surprising difference. The butter was made with a pendulum churn of Mr. M'Dougall's, which answers admirably well, and saves much labour.

	s.	d.
48 Quarts 3 pints of strippings, gave of butter 6lb. at 12d.	6	0
38 Quarts of blown milk, 1d.	3	2
7 Quarts of butter milk, 1d.	0	7
	<hr/>	
	9	9
48 Quarts and 3 pints of new milk, at 2d. per quart	8	3
	<hr/>	
Gain by butter	1	6
	<hr/>	

48 Quarts 3 Pints of a Mixture of Milk.

					s.	d.
48 Quarts 3 pints yielded	5lb. 3oz. of butter,	at	12d.	-	5	2
36 Quarts of blown milk	-	-	-	-	3	0
10 Quarts of butter milk,	1d.	-	-	-	0	10
						<hr/>
						9 0
48 Quarts and 3 pints new milk	-	-	-	-	8	3
						<hr/>
Which leaving a profit by butter of				-	0	9
						<hr/>

The advantage of oil-cake, in making butter, appears very considerable. Eight quarts of strippings give a pound of butter; and nine and a half of a mixture of the whole milk. In the Transactions of the Bath Society, Vol. IV. I see that 12lb. are stated to give a pound of butter. Wine measure is used in all the experiments.

I have thus, with the most exact attention to accuracy in my power, endeavoured to detail the experiments I have made in the last two years. The individual benefit reaped from it will be most satisfactorily proved by the certificates which accompany this. The numerous signatures bear ample testimony of its utility; and indeed when it is considered that butcher's meat is at 6d. per pound, and that good and nutritious milk can be obtained at 1d. per pound, (less than the price of bread) its advantages cannot be doubted. The health and condition of the cattle are certified for by all the farmers in the neighbourhood, and will, I am confident, be agreed to by those who have seen them.

I rejoice sincerely at the appearance of profit of the present year: it answers my most sanguine expectations, and confirms the opinion I formerly entertained, not only of the practicability of furnishing a plentiful supply of milk during winter, but also with a profit not unworthy the attention of any farmer. I trust that what I have done may stimulate others, and that the result will be equally successful, and prove a great acquisition of comfort to the lower orders.

The following estimate of expence and profit will rather fall short, than exceed, what may fairly be expected. In this I am confirmed by the opinion of those who were employed in conducting the experiment.

Value of Green Crop in 1805, Oil-Cake, and Attendance:

	£.	s.	d.
33 Acres of green crop at £5. per acre	165	0	0
10 Tons of oil-cake, at £10. per ton	100	0	0
Attendance	145	0	0
Chaff and straw	50	0	0
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Total expenses of green crop, oil-cake, &c.	460	0	0
To which may be added, for risk, capital, &c.	108	0	0
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	£.568	0	0
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Expense of keeping Milch Cows for 220 Days; to which Period *the Green Crop* is calculated to last:

	£.	s.	d.
30 Milch cows for 220 days, at 6d.* per day each	165	0	0
Attendance	60	0	0
Risk, &c. &c.	90	0	0
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	£.315	0	0
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The Produce of Milk, &c.

By 180 quarts of milk for 220 days	330	0	0
By calves sold	50	0	0
1000 Carts of manure from the proportion of sand, valued at 1s.	50	0	0
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	430	0	0
Expence of feeding, &c.	315	0	0
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Clear profit	£.115	0	0
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The average quantity of milk for each cow, 6 quarts; this is owing to the summer calvers, which are included in the stock: 8 quarts may be estimated on a moderate computation; this would have added 5s. per day, or £55. upon the whole period. A well selected dairy might reach 10 quarts, which would make an addition of £100. The next year I expect to have a better set, and do not fear making £200. by the same number. November is as early as a winter dairy should begin; till that

* 6d. Is charged, as some had no oil-cake, and cost only 3¼d. per day.

period milk can be had from pasture, and is neither of the service nor value at a later period.

Profit upon remaining Stock :				£.	s.	d.
50 Highlanders, at £4. each	-	-	-	200	0	0
17 Young cattle and others, valued at £6. each	-	-	-	102	0	0
150 Sheep, at 10s. each	-	-	-	75	0	0
4 Cows, fattening, at £12. 10s. each	-	-	-	50	0	0
600 Carts of manure, at 1s.	-	-	-	30	0	0
				457	0	0
Expense of feeding, &c.				253	0	0
Profit				£.204	0	0

Profit by milk	-	115	0	0
By stock	-	204	0	0

Total £.319 0 0

There was sold on the last day of January 22,000 quarts and upwards of new milk, which averages 183 quarts per day; in the last month upwards of 200 quarts per day, and may continue without much diminution for six weeks. I do expect the quantity of milk will exceed the estimate. Something, however, depends upon the state of the weather. I weighed some of the kohlrabi: I had white that weighed seven pounds and a half, with little or no top; and the purple five and a half. I think they would average five pounds.

I have now fulfilled to the best of my power the different statements connected with the experiment, and trust in the indulgence of your Lordship and the Board for any unintentional errors I may have committed. By delaying another year I might have made great improvements in my plan of feeding, and have produced a more flattering result. I am unwilling, however, to delay the communication. The profit is sufficient to encourage others, better qualified than I can pretend to be, to prosecute the plan from which so much benefit will accrue to the public at large.

I remain, &c. &c.

February 1, 1806.

THREE months have now elapsed since I had the honour of submitting to the Board a detailed account of my experiments in the feeding of milch cows, and as the period of 220 days, upon which the calculation was found, is also completed, I beg leave to add the subsequent proceedings, and the improvements in some particulars, which I have been able to effect. Having erected an apparatus for grinding of oil-cake, I have been enabled, for the last two months, to make a saving of one pound per day, in the feeding of each milch cow; and I find, that, when ground and boiled with caff, it has been more productive, and increased the quantity of milk.

The expence is now reduced to $5\frac{1}{2}d.$ per day for each cow.

					<i>d.</i>
Two stone of green food	-	-	-	-	$0\frac{1}{2}$
Two stone of chaff boiled	-	-	-	-	2
Two pounds of oil-cake	-	-	-	-	2
From six to eight pounds of straw	-	-	-	-	1
					<hr/>
					$5\frac{1}{2}$
					<hr/>

The quantity of milk up to the 20th of April, when eleven of the worst of the cows were sold, exceeded 180 quarts per day, which was beyond my expectation.

Forty thousand quarts and upwards of new milk have been sold up to the 1st of May.

	£.	s.	d.
The actual receipts for milk amount to somewhat above	360	0	0
Calves - - - - -	54	0	0
Manure, much undervalued at 1s. 6d. - -	50	0	0
	<hr/>		
	£.464	0	0
	<hr/>		

	£.	s.	d.
The expence, at the present actual cost of $5\frac{1}{2}d.$ per head, on 30 milch cows, for 220 days, will amount to	-	-	-
Attendance	-	-	-
Loss upon 11 of the worst cows already sold, at £2. 10s. each	-	27	10
Probable loss on the remaining 19 cows, estimated at £2. each	-	38	10
		<hr/>	<hr/>
		£.276	10 0
		<hr/>	<hr/>

Which leaves a balance of profit (on the supposition of the present expense of feeding) of £187. 10s. or £6. per head on each milch cow.

On beginning to feed with cole-seed, I found an almost immediate increase in the quantity of milk, and I cannot too strongly recommend it, as well for this object, as for its superior advantage over all other green crops in point of duration. What I sowed in August is still in use, and will, I confidently expect, serve through the whole of this present month.

The milk sold from 19 cows in the last two fortnights ending the last week in May, amounted to £21. 3s. 8d. or £181. 3s. 8d.; in the second fortnight £21. 10d. or 181 quarts per day; and a considerable profit will still accrue before they will be entirely deprived of their milk.

The enlightened and humane attention of the Board has been directed in an especial manner, to encourage the appropriation of small allotments of ground to cottagers, for the purpose of enabling them to keep a cow; yet, great as this benefit undoubtedly is, how small is the number that can profit by it, when compared with the lower class of inhabitants in towns! and I humbly conceive, that it is in the power of those who hold large farms to sell new milk, with a large profit to themselves, on cheaper terms than the cottager can procure it, and especially during the winter months.

I cannot too earnestly call the attention of landed proprietors to the advantages that would result from their requiring their farmers to supply a certain quantity of milk at a fair price for the support of the poor in their respective vicinities, at all events of those families who are employed in the cultivation of their own farms. And though the resulting profit may be of comparatively small importance in the scale of their annual gains, yet, as an act of benevolence, an attention to the interest of the most valuable class of men, it is an object highly worthy of consideration. Nor is its importance limited solely to the preservation of lives of a number of children, and the increase of comforts to the labouring classes of society. Compared with the other prime necessities of life, milk is not only the most nutritious, but the cheapest article of subsistence, that can be produced for the support of man. To prove this fact, we will compare its price with that of bread, and then with the average cost of butcher's meat. And, first, it appears, that bread, which is now at 3d. per pound, has not been sold lower than $2\frac{1}{2}d.$ during any part of the winter; whereas milk, at 2d. per quart, or 1d. per pound, is exactly one-third the

price of bread. Compared with butcher's meat it is one-sixth; and as a beverage and substitute for malt liquor, I conceive it to be a fourth; and it is certainly better adapted to the labourer than any other liquor, from its being of a slower digestion.

Viewing it as it concerns the public, milk affords the largest supply of victual from the least consumption of food. A great proportion of the food, which is so admirably adapted for producing milk, is not applicable to the feeding of fat cattle.

I conceive that the food necessary for a cow in full milking will not exceed one-third of what is requisite in feeding for the butcher, but it is in weight as 3 to 1; but allowing the difference in the quantity of food to be less than what I have taken it at, a milch cow, nine months or 270 days in milk, at 10 quarts in the two meals, would give 2700 quarts, or 5400 pounds weight of milk. Were the same annual fattened to 30 stone (of 8lb. per stone) a quarter, with an allowance of five quarters for the carcase and fat, the whole weight would be only 1200 pounds; and would be to milk only in the proportion of 1 to 4.

Supposing the average produce of each acre of wheat to be 24 Winchester bushels, at 60lb. per bushel; the actual nourishment derived from one bushel will be 37lb. of first flour and 14 of two inferior sorts, $8\frac{1}{2}$ lb. of bran, allowing half a pound for waste, making in the whole 60lb. or 1224lb. of flour per acre; so that it would require four acres to give the weight of flour equal to the weight of milk given by a single cow in 9 months.*

The advantages of a supply of milk for the use of the lower orders is great in every point of view; and, I trust, the discussion of the subject, and the bringing of it before the public, may be the means of extending the benefits which I have

* To show the gain of victual to the public, when compared with bread, the article of first necessity, we will state the total product of milk up to the last week in May, when the 30 cows had yielded forty-five thousand quarts of milk, equal in weight to ninety thousand pounds. The green food consumed, (oil-cake and chaff not taken into the calculation), supposing twenty tons to be the average of green crop per acre, would be less than four acres, but say five. Twelve hundred and twenty-four pounds being the product of an acre of wheat when made into bread. It would require seventy-three acres of wheat to yield ninety thousand pounds of bread. Thus sixty-eight acres are gained for other purposes upon a comparative scale between the product of milk and bread.

had the satisfaction, for these two years past, of introducing among the poor of my own neighbourhood.

May 25, 1806.

P. S. By adverting to the quantity of milk given in the month of May, with only 19 milch cows, it will clearly appear how much greater the profit would have been upon a well selected stock.

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